

## How Mangroves Story: On Being a Filter Feeder

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It is a drowsy Saturday morning and I'm out early, walking between road and fences, through human-oriented suburbs, to the mangroves at Lime Kiln Bay on the Georges River in Sydney's southern suburbs. As I enter the mangroves along the boardwalk here, I move into a darker world, one of twisted trees, diffuse light and the strange scuttling of crabs. Settling my attention into the mangroves, the sounds of joggers and dog walkers fade, along with the expectations of a world divided into solid land and fluid water. I become alert to mangrove movements, mangrove light. What matters changes. I realise I want to know how high the tide is and which way it is moving.

Right now, the tide is out and mud expands before me. I poke my fingers into it; it's sucky, sticky, dense with mycorrhiza and other filaments and pervaded by an oozy greenish slime. This mud is lively with plankton, algal slime, digestive bacteria from many kinds of guts and petrochemical films. It is a slimy digesting body both nourishing and toxic. Around and through the mud, filter feeders are waiting for the tide to turn. Oysters here pump large volumes of water and detritus through their bodies, filtering nitrates, plankton, algae and other particles through their gills for food. They expel faeces and also indigestible material wrapped in mucus which flocculates and settles out of the water stream into the accumulating mud, clearing the water and building and enlivening the bank. This fine mud around my fingers has passed through the bodies of something already, much of it many times over. I notice myself as a filter feeder: all the stuff that goes into me, transforms and comes out as a possibly nutritious substrate. Theory goes in, perception, conversations, various emotional flavours, information, most of it already well-worked over by others, much of it many times over.

I want to take you into the muck with me to filter again a well-worked theoretical topic—

relationality. This fluid expanding concept that like mangrove mud as muck depends on semiosis, citation and similar, operates at core as such. I understand as semiotic. Following thinkers such as Donna Haraway (*Trouble*), Karen Barad (*Meeting*) and Vicki Kirby ('Un/Limited'; 'Grammatology'), I elaborate and adopt their semiotic material accounts that take the continual processes of forming and edging, of affecting and responding, occurring within the world, as productive of and imbued with significance. This is a semiosis not restricted to human processes. Indeed, it rejects a parsing between material and conceptual. Rather, it acknowledges that all discrimination and relationship-performing involves forms of what, to use the terms of human linguistic traditions, can be described as reading, writing and interpreting. Within the particular contexts in which they

are meaningful, these semiotic processes might take widely varied forms, appearing as, for example, the discrimination of difference across a membrane; sedimentation sorting layers of different densities; senses becoming refined in responsiveness to stimuli through natural selection and chance events; or laboratory practices becoming established in response to the materials being explored and the social and political contexts of research agendas. This approach to relationality opens human and more-than-human relations to discussions about how they can be storied better—discussions about how to employ narrative strategies to support the relations needed to build flourishing, more-than-human futures.

Storying is an activity, so the call to responsibility that is so often associated with a shift towards relationality can perhaps be more helpfully conceived as a call to attend to how relations are written and interpreted, materially, in the making, as stories. Diverse human cultural practices and more-than-human ecological systems demonstrate many models for ways of storying carefully and respectfully. Many narrative strategies already exist within linguistic and other human cultural traditions, and within the relational practices of other species and populations that might potentially be interpreted into these relations. To engage with this account of relationality, I will begin by filtering semiotic materialist readings through another story—the story of a relationship—planetary, moon-moved, gravity-settled, tidal. This story performs much of the approach to relationality I will go on to discuss more explicitly.

The sea and the moon, entangled in an endless liaison, birth the mangrove from the body of the earth. Rocked by the tides, mangrove, child of three parents, looks to the moon for constancy, to the sea for change, to the earth for body. On the inward tidal surge, the huge weight of the salty world laps its edges through and over the muddy mangrove body. At the outer sea-facing edges of the mangrove, this inward surge can be swift and dramatic; massive volumes of salty water cutting new channels, filling crab burrows, pouring flotsam into the mangrove. At the innermost highest edges, tiny intrusions of moon-pulled moisture merely seep between grains of mud, softening and swelling them. Every tidal in-breath brings fragments of dead flesh, algae, bone and shell. This is the awaited bounty of the tide and many filter-feeding mouths are ready for its regular arrival. Zooplankton and bacteria in the water secrete mucus, which binds to tiny suspended mineral or plastic particles, aggregating them together into flocs that settle quickly from the flow as it calms within the mangrove environment, clearing the water (Duke and Wolanski 60). Each grain of marine sediment hosts between  $10^4$ - $10^5$  microbial cells (Probandt et al. 623), so mineral and biological intermingle in each particle settling into the mangrove mud. Many sea creatures also move into the mangroves with the incoming tide. Fish, first the tiny, then the larger, then the sharks, move into or alongside the mangroves (Duke and Schmitt; Kathiresan and Bingham). Danger follows safety as different but entangled opportunities open in succession.

On the ebb tide, the mangrove breathes air and opens to land creatures, to land stories. Humans and wading birds dig for worms and crustaceans in the surrounding mudflats. Semaphore crabs emerge into the air and light again, holding water around their gills for their water-based breathing, ready to swiftly retreat into water-holding burrows at any sign of danger (Duke and Schmitt 10-11). The males begin signalling to each other across the mud, waving their claws up and around, as they graze on the slimy green algal and bacterial film, known as detritus, that covers the mud and stones. This provides nourishment for many species; worms, shrimps, urchins, snails, fish and crabs. Out from the mangrove world, into the ocean, are washed wood, leaf, propagule, eggs, shells, oyster spawn, fish.

Tidal rhythms are regular but not simple as they move across the mangrove. There is a regularity of moon-driven beats, but there is also variation at many scales. The sun's gravity contributes to the rhythm's intricacies, tugging the spring tides higher, toning down the ebb tides when oysters sleep. And other rhythms are interfolded within the tidal. Wind-generated waves lick their energy against the mud and root mass of the mangrove body. Some waves are tiny, moving small particles, helping plankton wash into a space between mud grains. Others are huge, destructive, landscape-altering, mangrove-destroying. The rhythm of night and day transforms the mangrove too, as diurnal and nocturnal creatures and processes awaken and repose. Annual seasonal rhythms are layered into the mix and every animal and plant changes to the rhythms of their own body's temporalities. Floods, rain and drought diffract also within these rhythms, disturbing them in both predictable and unpredictable ways. Estuarine rhythms hold out the tantalising suggestion that their regularities can be read and interpreted by life's opportunistic, experimental processes, but the task remains challenging: the rhythms are tricky and there are many unpredictable disruptions.

There are agents of both regularity and unpredictability in an estuarine environment. Tides provide resources and predictable rhythm, but there are also many irregular disturbances. Both are needed for life to establish patterns and get complicated. From the biosemiotic perspective of Wendy Wheeler, 'cells and bodies are understood to be creative agents and active readers in semiotic touch with the world around them' ('Connoisseur' 375). Environments are full of signs for biological life which reads and writes itself in response and as response. Messages about possibilities, about chances worth taking, wash in and out of the mangroves on the tides, and estuarine life organises itself into meaningful narratives within this consistency and variation. Wheeler considers that biological complexity requires both sufficient regularity for material and behavioural patterns and habits to develop, as well as a certain amount of unpredictable disruption. Wheeler writes:

Although there must be stability, habit, "law", the reliability of repetition – and this is obviously so where communication and codings are concerned – chance is necessarily a part of any adaptive evolutionary system. Indeed, it must be

chance alterations in context (or environment), producing new responses which then become stabilised by habits, which generate the evolutionary process. ('Connoisseur' 386)

Life sorts and organises itself into patterns that continue and change in response to the challenges and opportunities it is able to read, and on the basis of the ways it has responded to its readings of past challenges and opportunities. Within tidal environments, life organises itself into complex semiotic mangrove forms such as crabs, trees, herons and molluscs.

Within a biosemiotic understanding, life involves unsettled iterative and experimental processes that produce and negotiate communication interfaces. These occur not only between individual organisms, but across all the varied interfaces of the biological world, including within cells, across cell membranes and within the processes of genetic replication, as outlined by Jesper Hoffmeyer ('Biosemiotics'; 'Semiotic Scaffolding'). Wheeler summarises this position, writing; 'biosemiotics tells us that *all* life, not just human life but *all life everywhere*, is about communication, semiosis, interpretation and meaning-making' ('Ecologies' n.p.). Processes of perception, for example, are interpretive and meaning-generating (Wheeler 'Bateson' 39). Perception requires some kind of memory—a way of holding a pattern—and some form of repetition. How this occurs varies widely among lifeforms, with much recent research exploring the diverse processes plants and fungi use for holding a pattern for future use (numerous examples are discussed by Michael Marder, Carla Hustak and Natasha Myers, and Tony Trewavas). Perception also requires processes of checking and double-checking sensation against other evidence, from other senses and from memory, and it requires guessing, in anticipation, at possible meaningful interpretations out of the impulses that are received, and connecting that anticipated form across time and space into narratives of consistent but changing form. To take a human example, within our cells the actions of the world are being read and translated into the complex narratives of our bodies. As Conolly suggests: 'human organs enter into tacit modes of communication with the outside world and with each other below the register of conscious recognition' (chapter 4, paragraph 58). Dynamic energetic inputs, and the emerging senses and semiotic frameworks that are interpreting them, inter-affect each other, communicate each other into discernible patterns. Mattering and meaning-making are in the process of being worked at together.

Similarly, between organisms, interfaces are thick with semiotic processes, reading, interpreting and writing relations and selves together. Vinciane Despret carefully details many such complex meaning-generating encounters between human researchers and the animals they study ('Models'; *Animals*; 'Secret'). She continually finds animals making efforts to meet what they interpret as the researchers' expectations of them. Further, she finds that, where researchers are willing and able to be similarly responsive to the

expectations animals have of them, new ways-of-being-human-and-animal occur, constructed together from the efforts of both to ‘disclose new forms of “being together”’ (‘Body’ 122). This ‘being-together’ is not merely human and animal reading and responding to each other, each remaining unaffected. Rather, the relation-making pulls them into a new ‘with-ness’ that affects them bodily and cognitively as much as behaviourally: ‘Both are active and both are transformed by the availability of the other. Both are articulated by what the other “makes him/her make”’ (‘Body’ 125). Haraway also describes this when she writes: ‘Critters do not precede their relatings; they make each other through semiotic material involution, out of the beings of previous such entanglements’ (*Trouble* 67). In their ‘involutionary’ reading of the relationship between *Ophrys* orchids and the insects which pollinate them, Hustak and Myers demonstrate that the ‘momentum through which organisms reach toward one another and involve themselves in one another’s lives’ (96) extends to relations between animals and plants.

Models of semiotic materialism that extend beyond the biological processes of life, beyond biosemiotics, derive from several traditions. Of particular interest for me here are Karen Barad’s work, which begins from quantum mechanics (*Meeting*), Donna Haraway’s discussion of the semiotic nature of materiality, which connects with her thinking about situatedness and diffraction (‘Promises’; *Modest Witness*), and Vicki Kirby’s work building upon Derrida’s foundational thinking in this area (‘Grammatology’; ‘Un/Limited’). Kirby blurs the division between ecology and semiosis; ‘a decision’, she writes, ‘is inherently ecological because it is “made” in relation, not because we are in a relation with the ecology—the object of the decision, the thing about which a decision is made—but because the ecology is the subject, “the who” that decides’ (‘Un/Limited’ paragraph 31). In her work ‘ecology’ and ‘semiosis’ become potentially interchangeable. These three approaches all offer credible theoretical groundings for a semiotic materiality beyond the biological. The story I am telling now, because it is grounded in tidal ecologies, follows Haraway and Barad in their accounts of diffraction and situatedness.

When waves move through gaps, or around an object, be that ocean waves rolling through a narrow estuary inlet, the soundwaves snapping shrimp produce for navigating their environment encountering objects, or light beams moving between air and water, the waves are bent and changed. This is the phenomena of diffraction. Waves are changed by their encounters, and because waves are at play, rippling through matter, right through from the gravitational waves that shape spacetime at cosmological scales, to the wave-like properties of quantum fields, diffraction is a possible way to explain the complexity and continual change of the patternings of the universe (Barad ‘Troubling Time/s’ 65; Barad *Meeting*). Haraway claims diffraction offers a more promising model for explaining the optics of materiality than representation. Representation, mirroring, or reflecting are all processes which intend a maintenance of integrity, an avoidance of change and, according to Haraway and Barad, presume a human actor who is outside the process. Diffraction, in

contrast, is 'a mapping of interference, not of replication, reflection, or reproduction. A diffraction pattern does not map where differences appear, but rather maps where the effects of difference appear' (Haraway 'Promises' 300). It can explain perception as enfolded into the materiality of the world. Senses are emergent as the diffractive affects occurring among intra-affecting matter, as patterns settle and change. Not only is this the case for the material becoming of sense organs, it is also the case for how the information gathered by senses is interpreted. The complex interconnectivities of nervous systems, the filtering qualities of porous but selective membranes, the networks of fibres transporting chemical signals within roots, branches and leaves are also emergent from those same ongoing diffraction effects, as these occur within the material flows within bodies of all sorts. The perceptual apparatus that read the patterns of the tides, and the processes that occur in response to those readings, can be considered material interpretations of interference patterns, interpretations within a semiotic materiality where the signs are diffraction effects.

Haraway also describes a materiality that is semiotic because of its situatedness. Within the mangrove estuary, there are choice spots for a crab or a heron or a mud whelk, and there are difficult places. There will be a heron and a mud whelk dealing with terrible difficulties under great stress, and there will be another heron and another mud whelk who encounter few stresses. Because all form-finding is situated, even that of inorganic materiality, it requires communication with the form-finding from other situations. Situations butt up against each other in all manner of ways, like it or not. Materiality therefore is a multitude of negotiations becoming variously meaningful among itself. The boundaries of this shifting multitude are its troubled interfaces of interpretation. As Haraway suggests, 'the knowing self is partial in all its guises [...] and therefore able to join with another [...]. Here is the promise of objectivity [...] that is, partial connection' ('Situated' 585). The hardships of a mud whelk are written into its body and affect its attentiveness. Each mangrove participant brings its particular semiotic legacy, patterned into its materiality, and in interacting, boundaries and relations are re-negotiated.

Within a materiality understood as semiotic, full of meanings being made and interpreted, relations are arguably narratives. Serenella Iovino and Serpil Oppermann suggest this when they write: 'material forms—bodies, things, elements, toxic substances, chemicals, organic and inorganic matter, landscapes, and biological entities—intra-act with each other and with the human dimension, producing configurations of meanings and discourses that we can interpret as stories' (Iovino and Oppermann 7). They clarify that a human interpreter is not required, that relations are storied from many perspectives, in widely varied vocabularies. Relations are stories that situated meaning-makers write to make sense of their experiences and knowledge of the immanent processes of boundary forming and changing stirred up by regularity and disturbance. Bruno Latour at one point required himself 'to ask the simple question: What do we do when we trace social connections?' His

answer, ‘Are we not, in effect, writing down accounts?’ suggests this narrativising process (Latour 122). A relationship is in the telling, in the making, storying-on. But narratives of relationality do not need to be told as closed or settled. They are poorly accounted for by imposing a singular, genre-delimited unchanging story. A tidal relationship is not only disruptive; it is not only regular; it is not only harmonious; not only a tale of flux. Relationships are slippery, lively, sticky, looping, passing through bodies, much of them many times over.

I wander now back into the mangroves to consider, with them, thick storyings of tidal relations. The moon affects the sea; there is a storied relation. I become aware of its diffractions shaping the shore and the mangrove, providing the rhythm for many mangrove lives. A new storied relation emerges through me, as its affects filter through my perceptual and other physical and cognitive processes, and through my linguistic, embodied and other interpretive habits. It emerges not as something I can characterise in a closed and captured way, but as a story that I am twisted into physically, culturally, linguistically and cognitively, a story that continues to thicken and twist as my experiencing of it changes. I come to know the relationship as an unfolding story that includes myself. My storying involves steps of guessing, trying, failing and sorting, as I intra-act among its diffractions and as they diffract through me. My world includes this relationship between the sea and the moon, which I can describe as tidal. It exists within the semiotic materiality of the world for me, and many others.

Mangroves also story the relationship between the sea and the moon. The relationship is sensed by the dispersed, varied and entangled senses of all those who, in their gatherings and negotiating of the vibrant mangrove, sense the tidal and moon changes. It is perceived among them too, as creatures, plants, micro-organisms and flows coordinate in paying attention to the tides and moon. And it is discerned by the mangrove in the way those perceptions translate into considerations within decisions and actions, over a wide range of time frames and in varied forms. The mangrove, as an entangled, dispersed and coordinating being considers the relationship between the sea and the moon in its behaviours, its constitution, its liveliness, its capacities.

Many beings are aware of, and respond to, a relationship between the moon and the sea. In orienting their interactions with the tides, the moon, the movement of mud and matter, they make this relationship from the inside by performing it, and from the outside by discerning it, the two always folded together iteratively, the writing and the reading continually diffracting together. Each way the relationship between the moon and the sea is storied, matters, in the doubled way Haraway and Barad mean it. Storyings become enacted. I might for example, align my behaviour—my surfing, shore walking, bird watching—with my way of storying this relation. Likewise, the mangrove’s storying is also enacted within its body, and so on with all the ways the relationship is storied. Despite this,

no singular relationship can be simply distilled or collected from the diverse storyings of the mangrove as some kind of overall summary—there's no position to do that from, and the terms used are not necessarily translatable. Similarly, I can't justifiably choose my relationship story, or the mangrove's, and impose it as the true story. Each one remains partial, situated, with all the possibilities of diffractions and inter-weavings and potential agreements and disagreements that offers, again recalling Haraway and Barad. Storying is a substantial, signifying movement. It is not however, one that justifies the production of a qualitatively privileged position.

Tales are told from perspectives that are composite, dispersed and changing. As Timothy Ingold astutely notes, perspectives come 'not from points at all, but along paths of movement' (Ingold 1800). They also need listeners, readers, rememberers, and retellers, who will also be composite, dispersed and changing. These tales both need and produce the semiotic frameworks within which they are meaningful. Relation stories can happen to varying degrees of resolution, or fuzziness; varying degrees of iterativity and narrative complexity. This is a creative process of meaning making, made within fluid circumstances. Such creative processes can be more or less risk-tolerant, more or less oriented towards security or efficiency or accommodation or generosity or competition (or other possible orientations stories can take). The storying may recognise its own guessing, experimenting, iterative processes of finding a best fit, or it may indeed involve some resistance to fitting, which also may be recognised. Or it may fail to include any recognition of these iterative processes, it may assume privilege, oversimplify, or lead to a rounding-off or closure.

There are narrative tools for keeping meanings open, for staying with more ambiguous meanings or with meanings that acknowledge their contextuality, for storying porous boundaries, for avoiding fetishising the settled plots that genre suggests. I find examples lingering with the mangroves of Sydney, who story inventively and experimentally across tidal folds. There are ways of storying that leave space for the stories of others, and even for the possibilities that there are other stories that our own may not be able to access or even imagine. Relations can be written so they pull up short of closure, so they remain at play across that fold where the immanent telling turns and locates itself outside of the story in a move towards discernment. My effort, with others, is to write and read relations across that fold, staying with the process. New insights can be folded back, while yet unresolved, to filter through another time, and another across that edge between immanent unfolding and emergent resolving.

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